CLAIMS

1) A method for determining variations of resistivity index (RI) of a family of rock samples of complex pore structure as a function of the water saturation (Sw), in the presence of a non-conducting fluid, comprising the following stages :

- for each sample of the family comprising at least a first and a second pore network, determining the volume fraction (f_1, f_2) occupied by each pore network by applying to the various samples an NMR type relaxometry technique,
- for each sample of the family, measuring by mercury injection the pore throat distribution in the various pore networks,
- determining experimentally on a sample at least of the family used as reference the values of coefficients (n_1, n_2) relating the variation of its electrical resistivity as a function of its water saturation (Sw), and
- determining the resistivity index (RI) of all the samples of the family on the basis of the variation of parameters describing the layout of the pore network (f_1, f_2, Sc, Sm) and using the values of said coefficients measured on the reference sample.

2) A method as claimed in claim 1, characterized in that the values of the coefficients (n_1, n_2) relating the total conductivity (Ct) of the sample to the conductivity (C_1, C_2) of the first and second pore networks and to the respective water saturations (Sw_1, Sw_2) of the two networks are determined from the reference sample, the resistivity index being calculated from the respective volume fractions (f_1, f_2) of the two pore networks and from the value of the mean saturation (Sc) from which the network with the smaller pores is invaded by the non-conducting fluid.

3) A method as claimed in claim 1, characterized in that, for a sample comprising a third pore network, the values of the coefficients (n_1, n_2) relating the total conductivity (Ct) of the sample to the conductivity (C_1, C_2) of the first and second pore networks and to the respective water saturations (Sw_1, Sw_2) of the first two networks are determined from the reference sample, the resistivity index being calculated from the respective volume fractions (f_1, f_2, f_3) of the three pore networks, from the value of the mean saturation (Sc) from which the network having the smaller pores among the first two pore networks is invaded by the non-conducting fluid, and from the value (Sm) from which the network having the larger pores among the first two pore networks is invaded by the non-conducting fluid.